Amendments to the Claims

1. (currently amended) An imaging system comprising:

at least one gantry;

a table for supporting and positioning a patient relative to said at least one gantry;

at least one x-ray source rotatable with respect to said at least one gantry and to said table;

at least one detector array positioned to detect x-rays produced by said at least one x-ray source~~, said at least one x-ray source producing a focal spot signal~~;

a collection system to acquire data received by said at least one detector array; and

a reconstruction system to process data acquired by said collection system; and

wherein ~~an x-ray scatter rejection system comprising means to modulate the intensity of each focal spot signal produced by~~ said at least one x-ray source is modulated for assigning ~~with~~ a signal ~~assigned thereto~~ to the x-rays produced by the respective modulated x-ray source, ~~means for demodulating a~~ and the signal is used to demodulate data from the detector array thereby to separate the data arrising from detection of the modulated x-rays from data arising from scatter from another x-ray source ~~detected signal from each intensity modulated focal spot signal having said assigned signal, and means for processing said demodulated detected signal to produce a signal having reduced scatter~~.

2. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and further including a plate member supported by said at least one gantry and rotatable with respect to said at least one gantry, said at least one x-ray source and said configuration of focused two-dimensional curved detector arrays being operatively attached to said plate member.

3. (previously presented) The imaging system as defined in claim 2, wherein said configuration of focused two-dimensional curved detector arrays comprises a first set of curved detector arrays to detect x-rays produced by said at least one x-ray source when the system is in the VCT and DR modes of operation, said first set of curved detector arrays and said at least one x-ray source being operatively attached to said plate member, a second set of detector arrays to detect coincident gamma rays when the system is in the PET mode of operation, and a third set of detector arrays to detect single photon gamma rays when the system is in the NM/SPECT mode of operation.

4. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and further including a plate member supported by said at least one gantry and rotatable with respect to said at least one gantry, said at least one x-ray source being operatively attached to said plate member, and said configuration of focused two-dimensional curved detector arrays being mounted to said at least one gantry and being substantially stationary with respect to said at least one gantry.

5. (previously presented) The imaging system as defined in claim 4, wherein said configuration of focused two-dimensional curved detector arrays comprises a first set of curved detector arrays to detect x-rays produced by said at least one x-ray source when the system is in the VCT and DR modes of operation, a second set of curved detector arrays to detect coincident gamma rays when the system is in the PET mode of operation, and a third set of curved detector arrays to detect single photon gamma rays when the system is in the NM/SPECT mode of operation.

6. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and wherein said at least one x-ray source is a single x-ray source and further including a plate member supported by said at least one gantry and rotatable with respect to said at least one gantry, wherein said configuration of focused two-dimensional curved detector arrays comprises a first single curved detector array to detect x-rays produced by said single x-ray source when the system is in the VCT and

DR modes of operation, said first single curved detector array and said single x-ray source being operatively attached to said plate member, a second set of detector arrays to detect coincident gamma rays when the system is in the PET mode of operation, and a third set of detector arrays to detect single photon gamma rays when the system is in the NM/SPECT mode of operation.

7. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and wherein said at least one x-ray source is a single x-ray source and further including a plate member supported by said at least one gantry and rotatable with respect to said at least one gantry, said single x-ray source being operatively attached to said plate member, said configuration of focused two-dimensional curved detector arrays being mounted to said at least one gantry and being substantially stationary with respect to said at least one gantry, and wherein said configuration of focused, two-dimensional curved detector arrays comprises a first set of curved detector arrays to detect x-rays produced by said single x-ray source when the system is in the VCT and DR modes of operation, a second set of detector arrays to detect coincident gamma rays when the system is in the PET mode of operation, and a third set of detector arrays to detect single photon gamma arrays when the system is in the NM/SPECT mode of operation.

8. (original) The imaging system as defined in claim 1 wherein said at least one x-ray source comprises a plurality of x-ray sources and further including a sequencing control system permitting any number of said x-ray sources within said plurality of x-ray sources to be simultaneously activated.

9. (original) The imaging system as defined in claim 1 further including a scatter rejection device operatively connected to said configuration of focused two-dimensional curved detector arrays, said scatter rejection device operable to reject those x-rays produced by said at least one x-ray source that have been scattered outside a pre-determined area.

10. (previously presented) The imaging system as defined in claim 1 further including a scatter correction device operatively connected to said configuration of focused two-dimensional curved detector arrays, said scatter correction device operable to collimate single photon gamma rays when the system is in a NM/SPECT mode of operation.

11. (previously presented) The imaging system and defined in claim 1 further including a collimation device interposed between the patient and said configuration of focused two-dimensional curved detector arrays, said collimation device operable to improve the spatial resolution, sensitivity and energy range of single photon gamma rays when the system is in a NM/SPECT mode of operation.

12. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and wherein said configuration of focused two-dimensional curved detector arrays is positioned so as to minimize spatial resolution reduction from a central axis to the maximal axis regions of a pre-determined area so as to produce an image comprised of pixel elements, each of said pixel elements being optimally focused towards its respective x-ray source to receive the optimum number of x-rays in said pre-determined area.

13. (original) The imaging system as defined in claim 12 wherein a selectable optical response of said pixel elements to x-rays is shaped to improve the spatial and contrast resolution characteristics of the resulting images.

14. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and wherein said configuration of focused two-dimensional curved detector arrays is positioned to minimize spatial resolution reduction from a central axis to the maximal axis regions of a pre-determined area, and wherein said at least one x-ray source has an anode with a surface having at least one V-shaped groove therein to produce at least one focal spot and wherein the resulting images are

comprised of pixel elements, each of said pixel elements being of a substantially constant radius and optimally focused toward its respective x-ray source focal spots, said x-ray focal spots being generated by said at least one x-ray source to achieve resolution in said pre-determined area.

15. (original) The imaging system as defined in claim 14 further including apparatus to geometrically dither said at least one focal spot to improve sampling and spatial resolution of the resulting images.

16. (original) The imaging system as defined in claim 14 further including apparatus to geometrically dither said configuration of focused two-dimensional curved detector arrays in the X and Z directions to improve sampling and spatial resolution of the resulting images.

17. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and wherein said at least one x-ray source is a plurality of x-ray sources and further including means to correct x-ray scatter, said x-ray scatter correction means causing a single x-ray source within said plurality of x-ray sources to be activated while the remaining x-ray sources in said plurality of x-ray sources are deactivated allowing those detector arrays in said configuration of focused two-dimensional curved detector arrays that are outside the x-ray path to detect scattered x-rays permitting real-time adaptive x-ray scatter correction.

18. (cancelled)

19. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and further including control apparatus including a gating system to synchronize data acquisition with an external physiological event, said gating system controlling the timing of said at least one x-ray source and said configuration of focused, two-dimensional curved detector arrays to acquire data based upon said

external physiological event, said gating system supplying signals to said selecting means to synchronize the movement of said at least one gantry and said table with said external physiological event.

20. (previously presented) The imaging system as defined in claim 1 further including a dynamic timing control system programmed with a time series of control events to perform precise dynamic imaging procedures when the system is in a VCT, spiral VCT, DR, PET and NM/SPECT modes of operation, said dynamic timing control system monitoring contrasting agent material flow through the patient and synchronizing data acquisition, VCT imaging rate, variable spiral VCT imaging rate, x-ray dose/mAs levels, with physiological events.

21. (original) The imaging system as defined in claim 1 further including an injector apparatus for injecting contrasting material or radio-isotopes into the patient, a gating system and a dynamic timing control system, said injector apparatus injecting contrasting materials into the patient at a predetermined time and being controlled by said gating system and said dynamic timing control system.

22. (original) The imaging system as defined in claim 1 further including a gated data image acquisition and reconstruction system for performing retrospective and prospective cardiac and vascular imaging, said gated data image acquisition and reconstruction system using data received by said collection system to produce images in a prospective mode to form a cine' view of a gated time set of x-ray VCT volume images of cardiac and vascular functions, said gated data image acquisition and reconstruction system using data received by said collection system to produce images in a retrospective mode to form a cine' view of a gated time set of x-ray VCT volume images of cardiac and vascular functions utilizing multiple sequential cardiac cycles to produce relatively shorter temporal volume images than in said prospective mode of operation.

23. (original) The imaging system as defined in claim 1 further including a gated data image acquisition and reconstruction system for performing retrospective

and prospective cardiac and vascular imaging, said gated data image acquisition and reconstruction system using data received by said collection system to produce images in a retrospective mode to form a cine' view of a gated time set of NM/SPECT volume images of cardiac and vascular functions utilizing multiple sequential cardiac cycles, and said gated data image acquisition and reconstruction system using data received by said collection system to produce images in a retrospective mode to form a cine' view of a gated time set of NM/SPECT volume images of cardiac and vascular functions utilizing multiple sequential cardiac cycles.

24. (original) The imaging system as defined in claim 1 further including a gated data image acquisition and reconstruction system for performing retrospective and prospective cardiac and vascular imaging, said gated data image acquisition and reconstruction system using data received by said collection system to produce images in a retrospective mode to form a cine' view of a gated time set of PET volume images of cardiac and vascular functions utilizing multiple sequential cardiac cycles, and said gated data image acquisition and reconstruction system using data received by said collection system to produce images in a retrospective mode to form a cine' view of a gated time set of PET volume images of cardiac and vascular functions utilizing multiple sequential cardiac cycles.

25. (original) The imaging system as defined in claim 1 wherein said reconstruction system uses data received by said collection system to reconstruct images from a helical volume spiral acquisition mode to produce whole body x-ray VCT volume images, said reconstruction system selecting data for helical spiral reconstructions while utilizing dose efficient angled cone-beam collimation, said reconstruction system processing imaging data while utilizing redundant data.

26. (original) The imaging system as defined in claim 1 wherein said reconstruction system performs step and shoot VCT volume image reconstruction with isotropic spatial resolution.

27. (original) The imaging system as defined in claim 26 wherein said step and shoot VCT volume image reconstruction utilizes traverse line projection data or spiral imaging data to fill in truncated view space so as to improve said volume image reconstructions.

28. (original) The imaging system as defined in claim 1 further including an x-ray whole body planning system permitting the acquisition of images from a multiplicity of angles while traversing the whole body of a patient to produce single, bi-plane, or multi-plane whole body projection images which are utilized to plan subsequent multi-modality imaging procedures.

29. (original) The imaging system as defined in claim 28 further including an adaptive x-ray dose control system using data received by said collection system to optimize patient dosage and desired image quality prospectively.

30. (original) The imaging system as defined in claim 1 further including an adaptive x-ray dose control system using data received by said collection system to permit adaptive real-time dosage control during the image scanning process.

31. (original) The imaging system as defined in claim 1 further including apparatus permitting the continuous updating of VCT volume imaging data in real-time on interactive displays and operator displays, said apparatus analyzing and processing imaging data in those regions where there have been view to view changes which exceed a predetermined level during the data acquisition process.

32. (original) The imaging system as defined in claim 1 further including an interventional image control system utilizing VCT, DR, PET and NM/SPECT images to control the acquisition of data by said collection system permitting the production of substantially real-time images of invasive procedures on the patient.

33. (original) The imaging system as defined in claim 32 wherein said interventional image control system includes an interventional planning system which

allows the planning of interventional procedures and compares real-time actual interventional procedures with planned interventional procedures and corrects said actual interventional procedures to substantially coincide with said planned interventional procedures.

34. (original) The imaging system as defined in claim 33 further including a minimally invasive robotic system to perform minimally invasive surgical procedures, said minimally invasive robotic system being operably controlled by said interventional planning system.

35. (original) The imaging system as defined in claim 1 further including an image analysis system to perform dynamic anatomical, physiological and functional imaging display, fusion and analysis of VCT, DR, PET and NM/SPECT images.

36. (previously presented) The imaging system as defined in claim 1 wherein said configuration of focused two-dimensional curved detector arrays includes an independent channel processing system for achieving high imaging count rates when the system is in PET and NM/SPECT modes of operation.

37. (original) The imaging system as defined in claim 36 further including a PET time stamping coincidence system for high count rate PET imaging, said PET time stamping coincidence system providing optimal coincidence digital time stamping of a positron generated gamma rays for real time randoms correction derived from average count rate adjustment and delay coincidence window rate.

38. (original) The imaging system as defined in claim 1 further including a PET anti-scatter collimation ring interposed between the patient and said configuration of focused two-dimensional curved detector arrays, said PET anti-scatter collimation ring comprising a set of baffles to reduce out-of-field scatter and to improve the coincidence rate.

39. (original) The imaging system as defined in claim 1 further including a PET transmission attenuation system for whole body PET transmission attenuation correction, said PET transmission attenuation system generating image projection corrections using VCT image and attenuation data.

40. (original) The imaging system as defined in claim 1 further including an NM/SPECT transmission attenuation system for whole body NM/SPECT transmission attenuation correction, said NM/SPECT transmission attenuation system generating image projection corrections using VCT image and attenuation data.

41. (original) The imaging system as defined in claim 1 further including a PET transmission scatter fraction correction system for whole body PET three-dimensional scatter correction, said PET transmission scatter fraction correction system generating projection scatter corrections using VCT image and attenuation data.

42. (original) The imaging system as defined in claim 1 further including an NM/SPECT transmission scatter fraction correction system for whole body NM/SPECT three-dimensional scatter correction, said NM/SPECT transmission scatter fraction correction system generating projection scatter corrections using VCT image and attenuation data.

43. (original) The imaging system as defined in claim 1 further including PET and NM/SPECT detector and imaging apparatus allowing multiple concurrent imaging for PET isotopes and NM/SPECT isotopes.

44. (original) The imaging system as defined in claim 1 further including a shape compensation filter for attenuating cone beam x-ray radiation to minimize patient dosage and to normalize the dynamic range of said configuration of focused two-dimensional curved detector arrays.

45. (original) The imaging system as defined in claim 1 further including a cone beam source collimator for spiral VCT imaging to reduce patient dosage and to substantially eliminate redundant imaging data.

46. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and wherein said at least one gantry is comprised of a first gantry, a second gantry and a third gantry, said first, second and third gantries being operatively attached to one another, and wherein said configuration of focused two-dimensional curved detector arrays is comprised of a first configuration of focused two-dimensional curved detector arrays positioned to detect x-rays produced by said at least one x-ray source when the system is in VCT and DR modes of operation, a second configuration of focused two-dimensional curved detector arrays positioned to detect coincident gamma rays when the system is in a PET mode of operation, and a third configuration of focused two-dimensional curved detector arrays positioned to detect gamma rays when the system is in a NM/SPECT mode of operation, said table supporting and positioning a patient relative to said first, second and third gantries, said selecting means comprising means for controlling the relative lateral movement of said first, second and third gantries with respect to said table and the rotational movement of said at least one x-ray source and said first configuration of focused two-dimensional curved detector arrays with respect to said first gantry and to said table.

47. (previously presented) The imaging system as defined in claim 1, wherein said at least one detector array includes a configuration of focused two-dimensional curved detector arrays, and wherein said at least one gantry is comprised of a first gantry, a second gantry and a third gantry said first, second and third gantries being operatively attached to one another, and wherein said configuration of focused two-dimensional curved detector arrays is comprised of a first configuration of focussed two-dimensional curved detector arrays positioned to detect x-rays produced by said at least one x-ray source when the system is in VCT and DR modes of operation, a second configuration of focused two-dimensional curved detector arrays positioned to detect coincident gamma rays when the system is in a PET mode of operation, and a

third configuration of focused two-dimensional curved detector arrays positioned to detect gamma rays when the system is in a NM/SPECT mode of operation, said table supporting and positioning a patient relative to said first, second and third gantries, said selecting means comprising means for controlling the relative lateral movement of said first, second and third gantries with respect to said table and the rotational movement of said at least one x-ray source with respect to said first configuration of focused two-dimensional curved detector arrays, said first gantry and said table.

48. (previously presented) The imaging system as defined in claim 1, capable of operating in VCT, DR, PET and NM/SPECT modes of operation, further comprising means for selecting the mode of operation of said system, said selecting means comprising means for controlling the relative lateral movement between said at least one gantry and said table and the rotational movement of said at least one x-ray source with respect to said at least one gantry and to said table.

49. (new) The imaging system as defined in claim 1, wherein the x-rays produced by said at least one x-ray source are modulated with a carrier frequency, and the carrier frequency is used to demodulate the data from the detector array.

50. (new) The imaging system as defined in claim 1, wherein the x-rays are amplitude modulated.